

IN THE CLAIMS

Please amend the claims as follows:

1. (Previously Presented) A magnetoresistive element, comprising:

a magnetoresistive film comprising a magnetization pinned layer, a magnetization free layer, and a nonmagnetic intermediate layer, a magnetization direction of the magnetization pinned layer substantially fixed in an external magnetic field, a magnetization direction of the magnetization free layer configured to change in the external magnetic field, the nonmagnetic intermediate layer formed between the magnetization pinned layer and the magnetization free layer and having a stacked structure of a first non-metallic intermediate layer/a metal intermediate layer/a second non-metallic intermediate layer which are stacked in a thickness direction; and

a pair of electrodes coupled to the magnetoresistive film and configured to provide a current in a direction substantially perpendicular to a surface of the magnetoresistive film.

2. (Original) The magnetoresistive element according to claim 1, wherein the metal intermediate layer has a thickness in a range of 0.5 nm to 20 nm.

3. (Original) The magnetoresistive element according to claim 1, wherein the first non-metallic intermediate layer is formed adjacent to the magnetization free layer, and the magnetoresistive element further comprising a first interface metal layer formed between the magnetization free layer and the first non-metallic intermediate layer.

4. (Original) The magnetoresistive element according to claim 1, wherein the second non-metallic intermediate layer is formed adjacent to the magnetization pinned layer, and the magnetoresistive element further comprising a second interface metal layer formed between the magnetization pinned layer and the second non-metallic intermediate layer.

5. (Original) The magnetoresistive element according to claim 1, wherein the metal intermediate layer contains at least one metal selected from the group consisting of Al, Cu, Au, Ag, Pt, Pd, Ir and Os.

6. (Canceled)

7. (Original) The magnetoresistive element according to claim 4, wherein the second interface metal layer contains at least one metal selected from the group consisting of Al, Cu, Au, Ag, Pt, Pd, Ir and Os.

8. (Original) The magnetoresistive element according to claim 1, wherein each of the first and second non-metallic intermediate layers has a structure in which a columnar conductive phase is formed in an insulating phase formed of an oxide, an oxynitride or a nitride.

9. (Original) The magnetoresistive element according to claim 8, wherein the insulating phase contains an oxide, an oxynitride or a nitride of at least one element selected from the group consisting of B, Si, Ge, Ta, W, Nb, Al, Mo, P, V, As, Sb, Zr, Ti, Zn, Pb, Th, Be, Cd, Sc, La, Y, Pr, Cr, Sn, Ga, In, Rh, Pd, Mg, Li, Ba, Ca, Sr, Mn, Fe, Co, Ni, Rb and a rare earth metal, and the conductive phase contains an element selected from the group consisting of Cu, Au, Ag, Pt, Pd, Ir and Os.

10. (Original) The magnetoresistive element according to claim 8, wherein the columnar conductive phase has a size of 10 nm or less.

11. (Original) The magnetoresistive element according to claim 8, wherein an area ratio of the conductive phase in each of the surfaces of the first and second non-metallic intermediate layers is in a range of 1% to 20%.

12. (Original) The magnetoresistive element according to claim 8, wherein the conductive phases in the first and second non-metallic intermediate layers and the metal intermediate layer are formed of the same material.

13. (Original) The magnetoresistive element according to claim 8, wherein the conductive phases in the first and second non-metallic intermediate layers and the metal intermediate layer are formed of different materials.

14. (Original) The magnetoresistive element according to claim 1, further comprising an antiferromagnetic layer formed in contact with the magnetization pinned layer.

15. (Previously Presented) A magnetic reproducing head, comprising:  
a magnetoresistive film comprising a magnetization pinned layer, a magnetization free layer, and a nonmagnetic intermediate layer, a magnetization direction of the magnetization pinned layer substantially fixed in an external magnetic field, a magnetization direction of the magnetization free layer configured to change in the external magnetic field, the nonmagnetic intermediate layer formed between the magnetization pinned layer and the magnetization free layer and having a stacked structure of a first non-metallic intermediate layer/a metal intermediate layer/a second non-metallic intermediate layer which are stacked in a thickness direction; and

a pair of electrodes coupled to the magnetoresistive film and configured to provide a current in a direction substantially perpendicular to a surface of the magnetoresistive film.

16. (Previously Presented) The magnetic reproducing head according to claim 15, the magnetoresistive element further comprising a first interface metal layer formed between the magnetization free layer and the first non-metallic intermediate layer.

17. (Previously Presented) The magnetic reproducing head according to claim 15, the magnetoresistive element further comprising a second interface metal layer formed between the magnetization pinned layer and the second non-metallic intermediate layer.

18. (Previously Presented) A magnetic reproducing apparatus, comprising:  
a magnetic reproducing head, the magnetic reproducing head comprising a magnetoresistive film comprising a magnetization pinned layer, a magnetization free layer,

and a nonmagnetic intermediate layer, a magnetization direction of the magnetization pinned layer substantially fixed in an external magnetic field, a magnetization direction of the magnetization free layer configured to change in the external magnetic field, the nonmagnetic intermediate layer formed between the magnetization pinned layer and the magnetization free layer and having a stacked structure of a first non-metallic intermediate layer/a metal intermediate layer/a second non-metallic intermediate layer which are stacked in a thickness direction; and

a pair of electrodes coupled to the magnetoresistive film and configured to provide a current in a direction substantially perpendicular to a surface of the magnetoresistive film.

19. (Original) The magnetic reproducing apparatus according to claim 18, wherein the first non-metallic intermediate layer is formed adjacent to the magnetization free layer, and the magnetoresistive element further comprising a first interface metal layer formed between the magnetization free layer and the first non-metallic intermediate layer.

20. (Currently Amended) The magnetic reproducing apparatus according to claim ~~[[1]]~~ 18, wherein the second non-metallic intermediate layer is formed adjacent to the magnetization pinned layer, and the magnetoresistive element further comprising a second interface metal layer formed between the magnetization pinned layer and the second non-metallic intermediate layer.